

## **An Integrated Design Environment for Millimeter-Wave Instruments**

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Several instruments operating in the microwave and millimeter-wave bands are to be developed over the next several years either at JPL or at JPL in conjunction with various other companies and laboratories. The design and development of these instruments requires an environment that can produce a millimeter-wave optics design, and can assess sensitivity of key design criteria (beamwidth, gain etc.) to thermal and mechanical operating environments. Currently, an integrated design tool is being developed to carry out the design and analysis using software building blocks from the computer aided design, thermal, structural and millimeter-wave optics fields. The capability to simultaneously assess the effects of design parameter variation resulting from thermal and structural loads can reduce design and validation cost and generally lead to more optimal designs, hence higher performing instruments.

In this paper the development and application of MODTool (Millimeter-wave Optics Design), a design tool that efficiently integrates existing millimeter-wave optics design software with a solid body modeler, and with thermal and structural analysis packages will be discussed. Under a common interface, interactions between the various components of a design can be efficiently evaluated and optimized. One key component is the use of physical optics analysis software for antenna pattern analysis. This software has been ported to various platforms including distributed memory parallel supercomputers to allow rapid turn-around for electrically large designs.

At this stage of its development, MODTool is being integrated into the JPL instrument development center, named Team I. This center is used for proposal study and early design of a range of instruments including those used for optical and in-situ measurements. The integration of MODTool into Team I allows the simulation of a wider range of instruments within Team I including their integration onto spacecraft systems—a topic that will be specifically discussed during this presentation.